

Abstract

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Numerical Modeling of Soil-Tunnel Interaction under New Surface Load

El-Azhar road tunnels, a major project of underground structures in Cairo, Egypt, were constructed by the tunneling boring machine (TBM). During construction of a proposed building over the existing El-Azhar road tunnels, Geotechnical challenges are expected to occur. An example of these challenges arises when the proposed building is constructed over the existing southern road tunnel. However, the serious damage in the road tunnel liners is predicted; the maximum radial displacement of the road tunnel is also computed. The allowable radial displacement of the road tunnel liners when the proposed building is constructed over the road tunnels should be checked within the allowable limit of 10 mm set by the Egyptian Standards. In the present study, the prediction of the impact of the proposed building construction on El-Azhar tunnels is highlighted; a model is proposed to study the soil structure interaction using a 2-D model of the proposed building on El-Azhar tunnels. The study is conducted using Finite Element Method. The constitutive model for this analysis contains elasto-plastic materials. A yielding function of the Mohr-Coulomb type; a plastic potential function of the Drucker-Prager type are employed. A linear constitutive model is employed to represent the tunnel liners. The effects are expressed in terms of settlement; radial deformation in the road tunnels. The study includes the prediction of the settlement, the relative movements; the lining stress under different loading steps. The description of the used model, the output results; the final conclusion are presented in this paper.